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**NASA Aviation Safety
Reporting System:
Tenth Quarterly Report**

April 1980

NASA



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**NASA Aviation Safety
Reporting System:
Tenth Quarterly Report**

**Ames Research Center
Moffett Field, Calif. 94035**

and

**Aviation Safety Reporting System Office
Battelle's Columbus Division
Mountain View, Calif. 94043**

NASA

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NOTE REGARDING STUDIES OF NEAR MIDAIR COLLISIONS

In response to requests from the FAA and various other organizations in the aviation community, the ASRS staff is conducting several studies of reports of near midair collisions. The first such studies had been planned for inclusion in this Tenth Quarterly Report, but it has not been possible to complete detailed review of the manuscripts in time to include them. The editors regret any inconvenience this may cause our readers.

NASA AVIATION SAFETY REPORTING SYSTEM: TENTH QUARTERLY REPORT

Ames Research Center

and

Aviation Safety Reporting System Office*

SUMMARY

This tenth report contains another in a series of studies of human factors in air carrier operations — Knowledge of Limitations of the ATC System in Conflict Avoidance Capabilities. The study addresses some of those assumptions and expectations held by airmen regarding the capabilities of the system. Limitations related to communication are described and problems associated with visual approaches, airspace configurations, and airport layouts are discussed.

The first section of this quarterly report presents a number of pilot and controller reports illustrative of three typical problem types: occurrences involving pilots who have limited experience; reports describing in-flight calls for assistance; and flights in which pilots have declined to use available radar services. The final section includes examples of Alert Bulletins and the FAA responses to them.

INTRODUCTION

This is the tenth in a series of reports describing operations of the NASA Aviation Safety Reporting System (ASRS) (refs. 1–9) under a Memorandum of Agreement between the National Aeronautics and Space Administration and the Federal Aviation Administration.

The first section contains reports illustrative of three separate problem categories. The second section is a research study of limitations of the ATC system and how they affect the conflict avoidance capabilities of the system. Finally, the report contains a selection of Alert Bulletins, issued by ASRS, and responses to them.

AVIATION SAFETY REPORTS

Introduction

ASRS Quarterly Reports customarily include a section devoted to narratives of safety-related incidents illustrative of typical problem categories. In this Quarterly Report samples are given covering three types of occurrences: Incidents that involve pilots who have limited experience,

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incidents in which pilots in distress call for or are offered assistance, and instances in which pilots fail to take advantage of available radar service.

Proficiency of General Aviation Pilots

In flying, as in many other forms of human endeavor, training, study, and practice are not in themselves sufficient guarantees of competence. Only through experience in actual performance is true proficiency achieved. Many reports to ASRS from low-time pilots testify to the lack of experience of the many variables encountered in the aviation environment; of these variables, weather conditions appear to be the most troublesome. Inability to interpret weather information correctly, or to judge accurately the severity of weather conditions encountered, often leads to inadvertent entry into instrument flight conditions, to course diversions that result in position uncertainty, or, through distraction and tension, to miscalculation of such factors as fuel and flight time. The reports that follow describe some occurrences in which, perhaps, greater experience might have saved the pilots from some apprehensive moments.

Event 1. I was doing my second 4-hour solo X-C from Melbourne to Ocala to Lakeland to Melbourne. I stopped at Lakeland for some rest and to check the weather. As I did my preflight, I computed the gallons needed to fly back to Melbourne and the situation was pretty good. I had one fourth on each 25 gallon tank — enough to get back. As I took off, my ground speed was less than I expected it to be. About 10 minutes later I saw to my left an aircraft. I knew I had the right of way, but I let him pass first (that was my first error). I followed him thinking that he was going to Melbourne. Later, I started looking for ground reference and used my VOR to get to the station. The instruments read 060° and my heading 110°, but I didn't rely on the instruments (that was my second error). Time passed and I decided to tune Patrick approach for a D.F. steer. I had no transponder and there was not much they could do. Soon I saw the East Coast, and I recognized the airport about 5 miles northeast. I got clearance and when I did my checklist, I saw the tanks — one empty. I switched tanks. (As I took off from Lakeland I forgot to lean the mixture.) I never told the tower of my situation. As I came on final, the tower told me to go around. The gauges read empty and the engine was running rough. As I came in for landing flare the engine stopped, but I landed safely.

* * *

Event 2. On Friday I departed PBI and stopped at SAV for fuel and to get FSS weather for the second leg to Tri-State. I was informed that weather was not VFR; I delayed at SAV until Saturday. FSS weather was VFR all the way to Tri-State. I filed VFR and departed SAV. North of the Blue Ridge Mountains it became hazy, but I had no trouble seeing the ground at 8,500 ft. Abeam Bluefield VOR it closed in under me at about 7,500 ft. I called Charleston Approach for position and was informed that I was 40 miles south of them. I informed them that I was strictly VFR-qualified with approximately 2 hours fuel on board and that my destination was Tri-State. They informed me that I had a problem, which I already knew. They handed me off to Huntington Approach Control and they in turn brought me into the airport via radar. I at no time stated I was IFR-qualified nor did I express any

type of fear stepping down through the clouds from 7,000 to less than 1,000 ft. I had complete confidence in the Approach Control personnel and knew that they were very confident in their work. Also, I had no intention of violating any FARs at any time. I attribute my calmness to the fact that I have many hours in a military aircraft as a crewmember and you might say that I was accustomed to such conditions. After my arrival at Tri-State I was informed that the preceding day there was unlimited VFR. I personally feel that the briefers at SAV were not totally accurate in their forecasts. Added note: I am currently taking IFR instructions and should have my IFR ticket in the near future.

* * *

Event 3. I decided to make three takeoffs and full-stop landings to maintain my recent night experience. I had noted that the sky was bright and appeared to be VFR. I departed runway 18 and encountered a layer of fog or clouds at about 400 ft, which restricted ground references. At this point, I decided to climb and contact Groton tower. They advised me to contact Quonset Approach Control. I had climbed to 1,500 ft MSL and was in VFR-On-Top conditions. I stated to Quonset that I wanted to go to an airport where I could land VFR. Another pilot radioed that New Haven was VFR and Quonset came back with a clearance to New Haven. I had no charts on board, and they then gave me the VOR radials and frequencies necessary. I proceeded uneventfully until I had Griswold Airport in sight and I landed at Madison VFR, canceling my radar service with Westchester Approach at that time.

* * *

Event 4. I took off from OAK. On my preflight I checked the fuel (a little more than three-quarters of a tank, about 19–20 gallons). I went to San Pablo Bay and there I was doing some maneuvers for a long time. Then I thought to come back to OAK, but I went to Antioch Airport to do some touch-and-goes without thinking about my fuel; then I flew near Concord VOR and then I was coming back to OAK, but crossing over Walnut Creek (at 3,500 ft MSL) the engine began to stop. At that moment I realized I was out of fuel. Before the engine stopped completely I chose a field to land, but I thought to try to get to Buchanan Airport. When I steered to the airport the engine and propeller were already stopped. At about 5 miles south of Buchanan Airport, I contacted the tower and asked for an emergency landing. At that time I was already aligned for 1R, but I had still enough height to get to 19L to land with headwind.

The problem was that I only thought about one thing – flying as long as possible because I am working on my commercial course and I have very few hours of flight. I DIDN'T FORGET ABOUT MY FUEL – ONLY ABOUT MY FLIGHT TIME.

* * *

Event 5. On a trip from Denver to St. Charles I got too close to the St. Louis TCA. The volume of traffic was light. I did identify myself to St. Louis Approach and talked to the supervisor after the incident. I was guilty . . . the supervisor was pleasant . . . I was and am low-time; I have good experience in the Chicago TCA but was not familiar with St. Louis. It was getting dark. I have figured out several ways to avoid such a problem in the future. The advertised hours of tower operation for St. Charles may have misled me some, although that is no excuse. I worked with Approach Control in Kansas City very satisfactorily, receiving traffic advisories that same day. Perhaps a requirement to work in at least one other TCA besides the one closest to one's training would be valuable. I will not get into another TCA without at least cross-referencing on two VORs so I know exactly where I am.

Fuel-state awareness, misjudgment of weather, and inadvertent penetration of TCA are relatively common examples of the types of incidents encountered by inexperienced pilots. The two reports that follow are more unusual and undoubtedly provided useful lessons.

Event 6. My wife, two passengers, and myself departed BTR for a pleasure night flight to Lafayette. I was cleared by Departure Control to LAF from the BTR VOR at 2,000 ft. Conditions were 4 miles, smoke and haze at BTR, and 5 miles, smoke and haze at LAF. En route over the swamp, the haze got thick so gradually that I lost sight of the stars and there were no ground lights in the swamp. The only reference was the lit highway that is a straight line between BTR and LAF, which became an optical illusion and appeared to come from the right — across the windshield and out above the aircraft, convincing me that I was in a right bank and diving. A check of the instruments indicated all was well and that I definitely had severe vertigo. A call to BTR Departure got no response, so we executed a 180° turn and my wife stayed on the radio. After an eternity we picked up BTR Departure calling another aircraft to relay to us. I cut in and informed Departure that I was now receiving him. Approach told me I was 25 miles out, gave me a course correction, and cleared me for a straight-in approach to runway 4 at Ryan Airport.

I believe that a notation should be put on the charts that IFR conditions may exist over the swamp even though everybody reports VFR, especially at lower altitudes, and the low altitude didn't do much for radio reception either. The next fledgling pilot who encounters the swamp at lower altitudes may not be as fortunate as we, especially at night.

* * *

Event 7. I advised tower that my position was 2 miles west of SCK VOR for landing. Prior to my call, a commercial jet was heard on tower frequency advising position and was cleared for landing on runway 29R. After my radio call, tower asked if I had the jet in sight; I reported no. Jet was then asked by tower if he had me visually; jet reported yes. At this time tower requested my altitude and I reported 1,200 ft. During my transmission I observed the jet entering a left base in my two o'clock position with approximately 3/4 to 1 mile separation at an altitude estimated by me to be 1,700 ft, descending. I then advised tower that I would be making a 360° turn, which I immediately initiated. Upon rolling out of turn I

observed the jet on final approach and estimated that I would be caught by wake turbulence at my present altitude.

I then entered a climb, hoping to get above the jet's altitude on base. After approximately 20 seconds into my climb, I encountered severe buffeting followed by what felt like a severe blow to the top of my right wing, causing the aircraft to roll to the right to approximately 70°. I lowered the nose of my aircraft and had to apply full opposite aileron to return to level flight. Fortunately I was above maneuvering speed. Further approach to airport was uneventful and I advised tower of wake turbulence encounter. Inspection of aircraft after landing revealed no damage to aircraft.

The pilot in the report above recommended that pilot education stress wake turbulence which, he feels, is a more powerful phenomenon than publications on the subject indicate. In fact he doubts that the full effect of a wake encounter can be appreciated until it has been experienced.

The last two reports in this group exemplify the classic case of the novice pilot geographically disoriented after encountering unexpected weather conditions. The first report came from a controller, the second from a pilot.

Event 8. Aircraft contacted Long Island Approach Control of 121.5 MHz. He was lost in IFR conditions and was a VFR-rated pilot. He was radar-identified 27 miles southeast of Long Island Airport, heading 160° over the Atlantic Ocean. His track was taking him farther out to sea. All airports in the area were IFR. He was radar-vectorred to overhead the Peconic Airport, descended to 500 ft, and landed safely. Peconic Airport was IFR at the time of landing. I don't know how the pilot got into this position, but I believe it was accidental and that he learned his lessons. Actions that I took were of an emergency nature.

* * *

Event 9. I called FSS for weather and to file VFR flight plan. According to information I received at that time, I could make Rockford and finish trip on following day. After passing Angola, weather conditions became slightly worse and radio reception was garbled. Somewhere southwest of Lagrange I decided to end the day's flying in Elkhart. When just west of Goshen, weather became minimum VFR or worse. Through one hole in the clouds we saw a row of airplanes; assuming this to be either Midway or Misawaka, I made a standard-rate 180° turn in an attempt to land at the field. Being unable to make visual contact with the ground, I made another standard-rate turn of 180°, holding 3,500 ft MSL and 290°. I made three broadcasts in 3 minutes on 121.5 before being picked up by Michiana Control and guided in for a landing on runway 9. The reasons for uncertainty about location in the Midway-Misawaka area was that turbulence left me little time for dead reckoning and the VOR receiver was not making a sensible indication, probably due to precipitation.

Calls for Help

The next group of reports concerns the plight of pilots caught in weather they were unqualified to handle, or who for other reasons required the guidance of ground personnel in order to get their aircraft safely back to earth. The first two reports are from controllers; in those following, the pilots tell their own tales.

Event 1. Small aircraft called Departure, reporting at 7,900 ft in IFR conditions. Pilot was not instrument-rated. Aircraft was vectored and descended to VFR conditions south of Indy and pilot proceeded to SDF on his own navigation.

* * *

Event 2. I was working Approach Control. I received a call from a very excited pilot claiming that he was lost and low on fuel. He had a very heavy foreign accent; for this reason it took me numerous communications to identify the problem and locate his position. After radar-identifying the aircraft and checking the surrounding airports, it was determined that Long Island MacArthur Airport was the best bet. I vectored the aircraft to MacArthur and had the pilot climb to 2,000 ft. Since he was already in the clouds, I felt that altitude was his best friend, considering his low fuel status. He did finally make visual contact with the airport and landed without further incident, though he landed on runway 10, instead of runway 6, as instructed. He had 5 gallons of usable fuel remaining.

* * *

Event 3. As a flight instructor, I approved solo cross-country flight for a student pilot, after careful checks of preflight actions and planning. Weather along the route later caused student to become disoriented, although stations near the route were reporting no significant weather. Student encountered unforecast low visibility — then called for help on 121.5 MHz. Aircraft was too low to receive radar or radio from ATC. Airline flight overhead suggested a “heading” for radar contact and student followed heading, off his planned route, and became lost with no radar contact. Student was eventually located and landed without incident. 1. Unforecast weather, not apparent in FSS briefing. 2. Heading assignment took student off route, still with no radar surveillance.

* * *

Event 4. After a weather briefing from Harrisburg FSS and VFR conditions reported along route of flight, a departure was made from York, Pennsylvania to Stewart Airport, Newburgh, New York. However, at the above-mentioned location, an unforecast area of clouds was encountered. Contact was made with Poughkeepsie FSS and information requested with regard to the weather conditions at Stewart Airport. Conditions were reported as being 2,500 ft overcast and 12 miles visibility. Since the destination airport was reporting VFR conditions and since operating under VFR conditions to the above-mentioned point, a decision was made to fly under what seemed to be a long but narrow area of clouds under an overcast of

approximately 3,000 ft MSL. While under this area of clouds at approximately 800 ft AGL, visibility conditions worsened because of low-flying clouds or ground fog. Obviously, a dangerous situation had developed and to assure terrain and obstruction clearance, a climb was initiated. The aircraft entered into scattered clouds which evidently at this point extended up to the overcast and upon leveling off at 3,500 ft MSL, the aircraft was in IFR conditions. In view of this situation, Poughkeepsie FSS was contacted and a position was established by use of direction-finding equipment. After ascertaining the full extent of the situation, the FSS specialist instructed that 7700 be squawked and Newark Approach be contacted. Radar assistance was requested from Newark Approach and, after ascertaining that the pilot was VFR-rated but undertaking training toward an instrument rating, the controller inquired if the pilot would be able to make a VOR or ILS approach. After giving some consideration to this, the answer was in the negative, as he was an instrument student and not proficient in instrument approaches. By this time the aircraft was out of the clouds but on top of the overcast. The controller provided an initial heading of 240°, which initially did not bring about improved conditions. Later, a heading of approximately 190° was given, along with improving conditions and information that Essex County Airport was VFR and that radar vectors were being provided to this airport. Instructions were given to inform the controller of the altitude when descending into the overcast and when having the ground in sight. After breaking out under the overcast and in VFR conditions, instructions were given to contact Essex tower. Thereafter, a normal approach and landing was made under VFR conditions. After landing, with 45 minutes of fuel remaining, the aircraft was refueled; after checking weather, a flight was made under VFR conditions to Stewart Airport. The factors that led to this occurrence are, I feel, encountering unforecast weather and a poor decision on the part of the pilot in command in attempting to proceed to the destination airport, which was reporting VFR conditions, by trying to underfly an area of low clouds. It would seem that more caution when encountering unforecast weather would certainly be in order and, along with this, greater care in not penetrating areas of clouds when not instrument-rated and operating under an instrument flight plan. Of course, the best preventive to such a recurrence is continued instrument training and acquiring an instrument rating. This is something I plan to do in the near future.

* * *

Event 5. I called the Burley Flight Service weather: clouds at 2,000 ft, variable-little wind, no forecast for destination – Hailey, Idaho. Took off from Twin Falls Airport, headed for Hailey. Conditions: slight breeze, partially cloudy, slight precipitation, good visibility. Shortly after takeoff, precipitation ceased. After I had flown approximately 25 miles (just past the town of Shoshone), there was a dense ground fog covering most areas except mountains. The closer I got to Hailey's Airport, the more cloud cover increased. The airport and town were impossible to locate through the dense ground fog. I then forfeited any possibility of landing. I changed my course back to Twin Falls. Cloud cover had increased dramatically since my flight to Hailey began; there were now continuous clouds. I climbed to an altitude of 10,000 ft to ensure that because of limited visibility I would not hit any of the mountains in the area, while also trying to clear the clouds. Unable to clear the

clouds, I was at this time flying strictly by instruments with no visible contact. I tuned in on the Twin Falls VOR and was flying a southern heading. I called Twin Falls tower and got the weather, explaining the situation. Twin Falls was completely clouded in and they suggested I contact Burley Airport. I contacted Burley Airport and, through their help and the Mountain Home Airport, they were able to determine my location. Burley Control guided the plane in by a series of magnetic headings. Periodically checking our location by radio transmissions, they were able to guide the plane to the airport. Through broken visibility of low clouds, I was able to locate runway 24 and land safely in Burley. Through the calm and precise efforts of all involved parties, especially the Burley Flight Service Station, and their exact, confident radio contact, a severe situation was efficiently handled. A situation such as the above described is very hard to prevent with the factor of quick-changing weather. However, after the situation did occur, every possible procedure was taken to ensure the flight's safety.

The two final reports in this "Call for Help" series do not involve flight into instrument conditions; wind is the villain here, confounding the pilots' navigation and making necessary the aid of ATC. In the second of these, the pilot was more experienced — in fact, was instrument rated, unlike the others in the series — but was caught, nevertheless, and obviously learned a lesson. It is interesting to note that in these "Call for Help" narratives, the effective aid of the ATC people is gratefully acknowledged by the reporters.

Event 6. I called the Columbus FSS and requested winds and weather for a flight departing from Fairfield County Airport (Lancaster) to Mansfield back to Fairfield County. He reported that winds were very light, and so I assumed that no wind correction angle would be required. About 30 minutes into the flight, I passed the Knox County Airport and made corrections that I thought would take me back on course. Later, not realizing I was off course, I saw a city and assumed that this was Mansfield. My instructor had told me that upon reaching the limits of the city I should contact Mansfield radio. I did and that was when I realized that I was off course as I saw a runway which did not resemble Mansfield's, from looking at my chart. I figured this was Ashland County and turned to a heading of 240°. I continued this course and passed over another runway, Shelby County, and at this time I called Mansfield radio, explained to them my predicament, and requested a DF steer. The controller gave me a beautiful DF steer which got me to the airport safely. After refueling, I headed back to Fairfield County and encountered no problems.

* * *

Event 7. I was on a local pleasure cruise from HNL-LIH-HNL to pick up some passengers and then return to HNL. VOR on airplane was not functional when I took off. I thereupon calculated the course to follow and left HNL for LIH (used the wind factor and calculated the course). No problems getting to LIH. However, on return flight, I didn't see land when my time expired. (I allocated myself an hour on the time.) Since visibility was 5 miles and the distance between Honolulu and Kauai is about 80 n. mi., a small off-course difference can mean a miss of Honolulu. When the time expired, I climbed up to 3,500 MSL and called the Honolulu Flight Service Station. They gave me a DF steer and the course to get back to Honolulu. As

it turned out, I was 30 miles south of Honolulu. Obviously I had drifted farther south than I thought. After FSS switched me over to Honolulu Approach Control, they gave me the 30-mile figure from their radar. No problems after that. In the Honolulu to Kauai leg, there are many inherent dangers in flying the course. First, I am very qualified as a pilot; I keep myself current on instruments (in Hawaii it's very difficult) and fly 12-15 hours a month, several of them for training. Second, I am aware of the MEAs between HNL and LIH. The MEAs should be placed on the sectional as reference to the VFR pilot who could easily lose the VOR when flying en route. It's obviously simple to get diverted from the islands just by a slight wind shift that causes a 5-mile difference. Pilots ought to be cautioned on this. With respect to my navigation, I'm certain that I will not fly the HNL-LIH trip without VOR, due to the obvious dangers that can arise if I am off course. The only possible alternative would be to get radar vectors from Honolulu Center as a means to go en route.

Negative Stage III

The third set of narratives in this Quarterly Report deals with flight through TRSA airspace by aircraft not participating in the available radar service. Timidity on the part of inexperienced pilots with respect to their radio communication techniques and reluctance to accept the possibility of delay as a result of being given evasive vectors are among the reasons why some pilots refuse to take advantage of the obvious safety factor of full participation in Stage III service. Whatever the reasons, such pilots increase the potential conflict hazard for themselves and for other aircraft in the area served by the terminal radar facility.

The selected reports that follow are typical of those received by ASRS; such reports are submitted by both controllers and pilots, with both expressing frustration that an important safety measure is so often bypassed. It is noteworthy that a large number of the potential conflicts of the sort discussed occur in the vicinity of navigational fixes — NDBs, VORs, and often ILS outer markers.

Event 1. Single-engine aircraft "A" called Rochester Departure Control 30 miles west of ROC for Stage III, landing ROC. Aircraft was at 3,000 ft, was radared and given current ATIS; pilot stated correct ATIS code. Nonparticipating aircraft within TRSA, opposite direction to aircraft "A," was given as traffic. By the time the other aircraft was sighted, evasive action was necessary by both aircraft. The targets merged on the scope and aircraft "A" confirmed that the other aircraft was at the same altitude. Same old story — VFR nonparticipating aircraft in the vicinity of a level III airport almost causes a midair!

* * *

Event 2. Air carrier aircraft "A" was on departure climb out on runway heading off runway 22. I instructed the pilot to remain on runway heading and issued traffic, a Stage III overflight, as the reason why I couldn't give him a turn at that time to join his route of flight, which was northwest bound. The pilot acknowledged the instructions and advised that he had small aircraft traffic ahead and slightly

higher at 3,000 ft and requested a turn to avoid it. I had noticed this traffic (a primary target), aircraft "B," at about the same time the pilot reported it. By now the Stage III traffic was no longer a factor and the pilot was issued a right turn to 320° to intercept the airway. I can only estimate by the pilot's report that they passed within a few hundred feet of each other. The pilot did report, "It's a good thing we turned!" I advised the local controller, but the aircraft was not in radio communication with the tower.

I would like to emphasize that this is not the first time this has happened, especially over the LILAC OM as well as the AVON NDB. I feel that possibly the lack of pilot knowledge on the part of the VFR aircraft was at fault. There is a high number of student and low-time pilots using the airport and refusing to use the Stage III service. I feel one of the major reasons for an incident like this is the pilots' not knowing where they are; another is their refusal to use the Stage III service.

* * *

Event 3. Burbank flight visibility was about 4-5 miles in the haze with the haze tops at 4,500 and clear above. BUR airport is within TRSA and its ILS runway 7 approach passes directly above the VNY airport where the outer marker is located. Aircraft "A" was on an IFR flight plan on the ILS approach into BUR just outside the OM about 6.5 n. mi. from the runway 7 threshold, descending on the glide slope at about 2,900 ft MSL, in landing configuration with gear and flaps down and all three strobes and two landing lights on. The approach was being flown by the autopilot with localizer and glide-slope couplers engaged to allow more time for scanning. Aircraft "B" was first seen in the middle of the right side of the windshield, heading northeast at the same or slightly lower altitude and at a distance of about 150 ft. Aircraft "A" immediately overrode autopilot and violently dove to avoid a collision. Other aircraft passed above and in front of aircraft "A," missing by about 25-40 ft. No action was ever observed by the pilot of aircraft "B." All unsecured articles in reporter's aircraft, such as chart books, passenger pillows, were thrown about the cabin; no injuries took place. When descent was stabilized, climb power was applied and left climbing turn instituted off BUR localizer after informing BUR Approach of the incident.

After uneventful landing, aircraft "A" had conversation with BUR tower and approach personnel and was told that at no time did radar operators ever see the other aircraft, before or after the near-miss. BUR ATC also informed aircraft "A" that neither they nor VNY tower had ever been in contact with the other aircraft, which was crossing the localizer near the outer marker at exactly the glide-slope intercept altitude within the Burbank TRSA and within the Van Nuys Airport Traffic Area I am beginning to believe that altitude-reporting transponders should be required for all operations in high-density traffic areas such as TRSAs, as well as in class I TCAs.

* * *

Event 4. Aircraft "A" (IFR), 4 miles east of LOU VOR at 3,500 ft MSL. Aircraft "B," 7 miles east of LOU VOR at 4,800 ft MSL, descending. Aircraft "C" (IFR), 5 miles southwest of LOU VOR at 2,500 ft MSL. Traffic was observed for "A" at twelve o'clock, 4 miles, southbound, just over the LOU VOR. Traffic was issued with a response that he was not in sight. The same traffic was then issued to "C" as ten o'clock, 4 miles, southbound. "C" responded, "Not in sight; keep us advised." The traffic was no longer a factor for "B" or for "A." "C" was then issued approach clearance and traffic eleven o'clock, less than a mile, southbound. "C" acknowledged the approach clearance and negative traffic in sight. Approximately 1/2 mile south of the LOU VOR, the unknown traffic and "C" passed. "C" finally acknowledged the traffic in sight and said each pilot had to take evasive action. He responded, "That was too close. I want to talk to you when I get down." I believe the reason for this near-miss was the fact that an aircraft that was VFR traversed an area which is congested with aircraft, and the pilot was not talking to anyone at the approach control facility.

* * *

Event 5. While vectoring aircraft "A" to left traffic for 11R at Tucson Airport, I observed an unidentified target proceeding from west to east just off departure end of Tucson's runway. The unverified Mode C altitude readout indicated 3,800 ft MSL and climbing. "A" had been told to descend to 4,000 ft MSL for his left downwind pattern. "A" was out of 4,600 ft descending 5 n. mi. east of the airport when the pilot was advised of the unidentified eastbound traffic. As the eastbound target approached "A," it appeared that "A" was climbing through 4,000 ft MSL. Pilot of "A" was told to maintain his present altitude (4,400 ft) and turn right — immediately — 20°. At that time the targets were within 1/2 mile of each other and (according to the readouts) within 100 ft of each other in altitude. The "A" pilot said that he was turning left to avoid the unidentified target. Tucson tower advised that they had never talked to the aircraft and that he had apparently flown through the pattern from southwest to east without a clearance.

HUMAN FACTORS IN AIR CARRIER OPERATIONS: KNOWLEDGE OF THE LIMITATIONS OF THE ATC SYSTEM IN CONFLICT AVOIDANCE CAPABILITIES

Capt. W. P. Monan*

. . . imprecise adherence to procedures developed through years of exposure to operations in a radar environment.

NTSB Statement of Probable Cause, Air Carrier Accident, 1977

. . . believing the aircraft to be at different altitudes, the approach controller did not issue a traffic advisory alert even though he saw the radar targets of the two aircraft converging on his radar scope.

NTSB Statement of Probable Cause, Midair Collision, 1978

Airman Assumptions and Expectations of the Capabilities of the ATC System

Typical air carrier crew report to the aviation safety reporting System (ASRS):

We had a near midair climbing out of XYZ airport. We were on a radar vector in the TCA, just turning to 090° heading and leaving 9,500 ft. Just as I leveled the wings, the flight engineer called out "traffic twelve o'clock!" I had to push the yoke forward to miss a small red and white aircraft. We passed underneath him by approximately 200 ft. When we advised the controller that we almost hit a small aircraft, he said, "Now, I see him. Six o'clock and a mile." Why is it always six o'clock with the close ones?

On the surface, and as it obviously appeared to the reporting pilot, this typical ASRS narrative *apparently* indicates a radar controller's perceptual error which almost resulted in a midair collision. No traffic advisories on a converging aircraft had been transmitted; therefore, the controller had failed to do his job properly. However, routine analysis by ASRS researchers reveals other secondary causal factors associated with the incident. Semiconcealed in what was not said in the narrative are pilot assumptions and expectations that led the flight crew "down the garden path" of wrongful anticipation.

Two cockpit assumptions are apparent: (1) The air carrier was operating in the tight radar security of TCA airspace and (2) ATC radar has the capability of "painting" all aircraft targets in the air carrier's flightpath. These assumptions would lead logically to the expectation of all pertinent traffic advisories. How this expectation affected outside-the-cockpit scanning vigilance can only be surmised.

A quick review of aeronautical charts confirms the ceiling of the TCA at XYZ airport, in the airspace location where the incident occurred, to be 7,000 ft. The airliner, out of 9,500, had not only exited the terminal airspace but was penetrating the congested TCA boundary altitudes used frequently — and legally — by nontransponder-equipped, light aircraft skirting the control area.

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Furthermore, the Airmans Information Manual (AIM), corroborated by a substantial number of ASRS reports, states that many primary returns from light aircraft do not display, or paint only faintly, on the controller's radarscopes.

It is very important for the aviation community to recognize the fact that there are limitations to radar service and that ATC controllers may not be able to issue traffic advisories concerning aircraft which are not under ATC control and cannot be seen on radar.

In addition, studies of near midair conflicts reported to ASRS at specific airports show that most air carrier encounters with VFR traffic that occur just outside TCA airspace boundaries are not pointed out by the radar controller. The controller may be occupied with higher priority duties which prevent issuance of advisory messages concerning aircraft not normally participating in the air traffic control system. Furthermore, if the VFR aircraft are not equipped with altitude reporting transponders, the controller would be calling out numerous targets that might be at altitudes far removed from the air carrier's flightpath.

Thus, in the final analysis of the incident, unwarranted expectations of radar controller intervention by the airman and his lack of exact knowledge of ATC system limitations apparently were the decisive factors in contributing to the conflict.

When the judgment of "probable cause" on the conflict occurrence quoted above was rendered — a decision routinely made within the province of the ASRS Program — the airman reporter might have been surprised: "Lack of vigilance by VFR pilot and air carrier flightcrew during operations in a see-and-avoid environment."

No air carrier pilot could operate efficiently or successfully within U.S. airspace without anticipation of many and diverse ATC procedures, controller actions, and clearance communications. In fact, from a user's pragmatic viewpoint, the entire ATC system functions as a series of to-be-fulfilled expectancies as to what will occur next. It is when pilot expectations are not fulfilled, or when expectations are premised on erroneous or unrealistic concepts, that the first circumstantial links for a potential midair collision are formed in the typical accident chain alignment.

The ATC system, which is operated and utilized by human beings, is always vulnerable to human error. Its capabilities can be limited by equipment malfunctions, saturation, overload, and miscoordination. Knowledge of the limitations of the system, and of when and where it is most likely to fail or to display deficiencies or inadequacies, can serve in the early recognition and avoidance of potential midair conflict situations. As ASRS statistics indicate, "Big brother" is not always watching. Furthermore, he is not always listening.

Basic ATC System Limitations in Midair Conflict Avoidance

In a very broad sense, air carrier midair conflicts, within U.S. airspace, are avoided by controller intervention and averted by pilot evasive actions. These two sets of human actions, formalized with prescribed roles, duties, and responsibilities into the twin concepts of radar surveillance or the see-and-avoid concept, represent the ultimate capabilities of the ATC system in preventing

midair collisions. When operating within a radar environment, these two concepts dovetail into a double, often overlapping, shield of protection against traffic midair conflicts.

Inasmuch as the system's anticollision concepts are composed of human actions, any behavioral error or failure may affect the system. If both pilot vigilance and controller monitoring are eliminated, good luck or the vagaries of fate may well determine the final outcome of any converging aircraft situation.

This study does not touch upon these human factors per se; instead it deals with the ATC system as it is limited by user mismanagement or by airman misunderstanding of its functional capabilities. Radar surveillance service may fail for myriad reasons, may be withdrawn in accordance with procedural regulations, may even be misled, through ambiguous crew communications, into controller belief that intervention is not needed or required. Under these circumstances, the flightcrews are usually unaware that they are operating solely under the "last chance filter" protection of the see-and-avoid concept.

Although industry debate may rage pro and con over the see-and-avoid concept as being a DC-3 procedure used in a jet environment, any withdrawal of radar monitoring, when unknown to the flightcrew, represents a serious operational limitation of the ATC collision avoidance system.

In ASRS conflict reports, the occurrence of even a minor ATC "system error" often results in the double hazard of (1) elimination of adequate or timely radar monitoring of the aircraft and (2) continued cockpit expectation of radar intervention.

Even without human error, there are flight phases during which radar surveillance is withdrawn without the pilot being advised. After transfer to tower frequency during conduct of visual approaches, airmen often apparently continue to anticipate the protection of radar intervention. This is a serious pilot misunderstanding of standard ATC procedures.

The message "radar service terminated" is frequently transmitted in domestic airspace when an aircraft is cleared for approach into a nonradar airport or when en route and departing from radar-covered areas. Flightcrews in international or overocean operations are accustomed to hearing the final, meaningful signoff from ATC as the aircraft departs U.S. continental airspace: "Radar services terminated"

There are no such advisory messages when the ATC radar monitoring system fails to intervene during conflict situations; thus, when radar advisories are terminated without warning, the pilot is not alerted to the need for an extra measure of vigilance for other traffic.

Communications— All airman expectations of ATC functions or the fulfillment of those expectations are channeled through the air-ground-air communication link. In midair traffic avoidance, the mutual exchange of information is essential in the implementation and the continuous balancing of the priorities of controller and crew in the discharge of their roles and responsibilities. The reassuring controller transmission of "in radar contact" initiates the concept of radar surveillance. "Traffic at twelve o'clock activates necessary pilot vigilance under see-and-avoid fundamentals.

These two protective concepts, intertwined by communications throughout the air carrier operation, must survive intact through innumerable ATC control boundaries, interfacility

communication, coordinations, frequency changes, transfers, and sector-to-sector handoffs. Any factor that delays, impairs, or breaks cockpit-controller communications poses serious hazards that can lead to midair encounters.

Unfortunately, oral radio communication is the weakest link in the ATC system. Misunderstanding of ATC clearance messages leads to more midair conflicts than any other system operational factor reported to the ASRS.

The ground-to-air link, or "Whaddesay?": Probably the most frequently noted cause for clearance message errors in the cockpit is the lack of backup monitoring of ATC communications. The distraction of a crewman resulting from use of the passenger public address system, company radio transmissions, cabin service difficulties, ATIS monitoring, and myriad workload routines results in the expression most frequently heard in cockpits, "Whaddesay?"

Whatever the reasons, justifiable or not, air carrier flightcrews become vulnerable to serious error when crew-concept monitoring is eliminated from the ATC communication loop. When clearances are not read back, there is no "second chance" for any misunderstanding to be rectified. Even when ATC clearances are repeated, ASRS submissions of "system errors" narrate frequent controller self-admissions of failure to listen to the readback. As in the cockpit, workload distractions are the usual reasons cited by controllers for lack of message confirmation. So common is this monitoring failure that a fatalistic cynicism surfaces in this report:

I was busy on the P.A. system talking to the passengers while the F/O took the climb clearance. He read back "17,000" and the controller "rogered" it. Later, we were told we had been cleared only to 16,000. On the line we have a saying that they'll roger anything they hear at that facility.

Such a report passes by the primary and enabling cause: cockpit distraction resulting in crew-concept failure in communications monitoring. Yet, the pilot's expectation that the ATC system would catch the misunderstood altitude readback is the clear tenor of the complaint.

Communications air-to-ground are not always oral: altitude-encoding transponders emit their altitude message continuously to ground radar. Even aircraft so-equipped may not always be challenged for an incorrect altitude readout. One airline pilot operated a short-distance flight leg with an altimeter misset by 1,000 ft. He found his error when he attempted an ILS approach at his arrival airport. Although he admitted the initial error, he wondered why radar controllers had not intercepted his en route off-altitude squawk.

More difficult to understand is apparent pilot reluctance and hesitation to request confirmation or clarification of doubtful ATC instructions or clearances. There are numerous airman reports to the ASRS that detail lengthy intracockpit discussions about the exact altitude, heading, DME distance, or direction of turn that might have been transmitted. In some instances it appears that the more positive or more aggressive crewmember persuades the other as to what was heard. Also, there is some evidence that suggests that one pilot hesitates to express lack of confidence in another pilot's accuracy or reliability.

After takeoff we were given a turn and changed over to departure frequency. I questioned the F/O who had said "roger" to the clearance and he said he was

positive it was a left turn. The weather was not good and I knew there was traffic. I started a very gradual left turn. My decision was that if ATC didn't say anything right away, I was going to question the left turn. They did, and told me to turn right, to 180°. I still don't know if my turn was wrong in the original clearance or my F/O was wrong. The big lesson I learned is that when workload has to be shared, you can't trust anyone.

* * *

We got mixed up and confused the 10 DME distance with altitude assignment and we busted our altitude crossing restriction. I suggest that pilots be told to ask ATC for clarification rather than assume they have read a descent clearance correctly.

The ground-to-air link: "I heard what I expected to hear": Behind every psychological strength is the shadow of its weakness; in airman human factor performance, long experience over a scheduled route system may lead to an exaggerated assurance of anticipated ATC clearances, restrictions, or messages. The greater the experience, the stronger will be the pilot's expectation that the departure will be via the same "canned" flight plan, taxiied to the usually used runway, assigned to the usual initial altitude over familiar fixes, and cleared to climb to and maintain usual flight levels.

This psychological element results in one of the more frequently used sentences in ASRS airman reports: "I heard what I expected to hear."

I had flown this route many times previously and as I recall previous clearances had been "cross point XYZ at 8,000 or below." It was this same clearance for many years. Probably I was mentally programmed for a similar clearance and accepted the F/O's departure from the clearance.

The setting, prior to takeoff, of an altitude select to an anticipated ATC altitude assignment is an obvious temptation to route-experienced airmen. It also leads to a continuing series of "altitude busts" in air carrier operations. Several serious route excursions were narrated by pilots who had failed to catch an unanticipated change in their flight plans as issued by clearance delivery. Often these incidents were associated with cockpit workload distractions.

When anticipated ATC clearance for descent has been delayed, or if the aircraft is "stepped down" in slow increments, air carrier crews are especially "spring-loaded" to hear what they expect to hear. An ATC clearance to an aircraft with a similar call sign plus overexpectation combine to produce a hazardous communication mixup. Abbreviated "roger" responses or other ambiguous transmissions reinforce controller belief that the correct aircraft has received the descent clearance.

Anticipation of ground controller clearance to cross adjoining parallel or intersecting runways is involved in the afterlanding, rollout phase of operations. The workload distraction is high: one pilot is normally giving total attention to aircraft handling, reversing or unreversing, speed and brakes. Rain, fog, or wet runways require added concentration. Instructions such as "Hold short of . . ." may not register during such concentrated high-load work cycles.

The air-to-ground link: Apparent cockpit reluctance to request clarification or confirmation of ATC clearances and ATC instructions carries over into communication exchanges during potential conflict situations. The most prevalent indication of such hesitation is failure to advise the radar controller if a converging target point-out has been definitely sighted or if the initial sighting has been lost. Ambiguous responses often mislead the controller into believing that traffic has been sighted. A "traffic at twelve o'clock" advisory answered by a crisp "roger" permits considerable controller latitude in assuming that the "roger" affirmed the sighting rather than mere receipt of the message.

The verbal projection of an assured, self-sufficient command image may be a psychological block to airing a message that might connote doubt, puzzlement, or need of assistance in handling any in-flight situation. The airman's basic reluctance to transmit in-flight problems to ATC facilities appears to be substantiated by the latest statistics in the annual report of the Air Force Rescue Coordination Center. In 1978, there were 700 ATC alerts or requests for ATC assistance in the handling of in-flight emergencies or malfunctions; 517 of those came from military aircraft. The report concluded that both general aviation and commercial crews were hesitant in alerting FAA controllers to any need for priority traffic handling or standby crash equipment for their arrival.

The airline command role is a delicate and sensitive human factor in the rat-a-tat, fast moving interaction of ATC functioning with pilot responsibilities. ASRS reports include angry confrontations ("I'll fly my airplane and you fly your desk . . .") when pilots believe that controllers have encroached upon their in-flight authority. However, verbal portrayal of total self-sufficiency which effectively eliminates radar controller intervention is an unnecessary self-imposed limitation to the ATC conflict avoidance system.

The cockpit voice recorder (CVR) and the ATC tapes of the San Diego midair collision appear to illustrate communication characteristics common to numerous ASRS conflict incidents. According to NTSB testimony, the air carrier crew apparently had lost sight of the small aircraft that had been previously pointed out by radar. In response to the tower's advisory "traffic at twelve o'clock, 1 mile," the pilot replied: "Okay, we had it there a minute ago." And later, "I think he's pass(ed) us off to the right." Yet, the CVR showed that the crew continued to discuss among themselves the possible location of the aircraft. When the conflict alert warning sounded, the approach controller did not inform the tower, because he believed the airliner crew had the light aircraft in sight.

In addition to ambiguous responses, use of nonstandard phraseology may lead to misunderstandings of conflict-sighting communications. The softer vowel sounds may slide into similar sounding words. For example, one controller reported that he thought the pilot said "in contact"; however, tapes made it clear that he had said "no contact." As a consequence, an aircraft making a practice instrument approach had to take violent evasive action when a second aircraft lifted off during an intersecting runway takeoff.

Perhaps no pilot transmission is more phonetically emphatic and more understandable than the word "negative." Direct, immediate, and unequivocal cockpit responses to radar traffic advisories would reinforce a need for the controller's intervention during conflict situations.

*Conflict avoidance limitations of the ATC system associated with visual approaches—*One of the more routine air carrier pilot expectations is receipt of an approach controller's transmission: "Cleared for a visual approach, change over to tower frequency . . ."

Although airmen, through faulty communication techniques, may inadvertently “wire out” the protection of radar surveillance, the visual approach clearance procedurally removes the radar backup to the see-and-avoid concept.

There are strong inferences in ASRS reports that many airline pilots expect continued radar separation service, traffic advisories, and radar intervention throughout the approach. This is a false expectation. The current AIM states it succinctly. The radar controller “provides radar separation until the pilot accepts a visual approach clearance . . . and continues flight following and traffic information until the aircraft is instructed to contact the tower.” The pilot’s role during visual approach is to “be aware that radar service is automatically terminated without advising the pilot when the aircraft is instructed to contact the tower.”

Explicit wording such as this emphasizes crew responsibility for definite and correct sighting of pertinent traffic as pointed out by radar prior to tower transfer.

At approximately 15 miles out and 6,000 ft, we reported the airport in sight. Approach Control cleared us for a visual to 17L and moments later they said “Traffic at twelve o’clock, 5 miles, contact the tower!”

We contacted the tower. There was no further mention of traffic. While in a shallow turn onto final, I observed a light airplane less than a mile and closing. We pushed over to avoid collision. We estimated miss by 200 ft horizontally and 50 ft vertically. Time from observation to evasive action approximately 2 to 5 seconds.

Many ASRS narratives of converging targets involve absence of any pilot requests for immediate radar intervention when targeted traffic had not been sighted.

I gave traffic several times to the air carrier. Not sighted. When the airliner turned base, the two targets merged. I instructed him to change over to the tower. His reply was, “That aircraft we just missed was at 3,400 ft.” His Mode C was reading 3,400 when the targets merged.

Air carrier flightcrews may believe, erroneously, that their filed IFR flight plans will automatically trigger radar vectoring around radar point-outs of VFR aircraft targets. Controllers have no authority to offer such vectoring services voluntarily.

When requested by the pilot, issue radar vectors to assist in avoiding the traffic . . .

Controller Handbook (7110.65B) p. 85.

Furthermore, there should be no airman expectation of controller response if the flightcrew reports that VFR traffic has not been sighted.

If the pilot informs you that he does not see the traffic you have issued, inform him when the traffic is no longer a factor.

Controller Handbook (7110.65B) p. 85.

After transfer to tower frequency, loss of the initial sighting becomes a critical element in many midair events:

We were cleared for a visual approach to maintain 2,500 until clear of a light aircraft. We had the traffic and descended. After we turned, the light aircraft was not in sight; we assumed he was inbound to the opposite side of the field. As we turned final, at 2,000 ft, we saw the small aircraft directly underneath us. We were about 400 ft over him.

As a probable aftermath of the San Diego midair, several ASRS reports reflect air carrier crew unease in accepting a controller transmission that "The other aircraft has you in sight, change over to tower frequency."

When converging aircraft are working different VHF frequencies, the loss of visual sighting becomes more hazardous. An outbound air carrier crew who had been advised by Departure Control that an approaching aircraft had them in sight reported as follows:

The best I can recall of the traffic advisory is "Inbound aircraft at one o'clock, 2 miles, out of 5,500. He has you in sight." Just as I was rolling the wings level out of a turn, I saw the traffic converging on us. I leveled off; he kept converging and descending at us. I descended, trying to maintain visual separation, and finally stopped at 3,700 ft. At that point the controller told us we were clear of traffic.

Pilot expectation that the tower facility will continue the approach control's radar service is evidenced in this report:

We had been turned over to tower. Tower cleared us for a visual to runway 12. At 1,500 ft, upon rolling out of our turn, I saw another aircraft exactly at our altitude and about 150 yards away. He was in an extremely nose-high attitude as though he was trying to avoid us. I immediately descended and the aircraft passed directly over us. Upon talking to the controller, I was advised that the tower had no radar, was not in radio contact with the other aircraft, and did not know of his presence in the area.

Although some tower facilities have alphanumeric displays and others have BRITE or ARTS I, II, or III installations, conduct of radar surveillance is not a required ATC function during visual approaches. In fact, the total absence of tower radar capabilities does not merit out-of-house publication of the locations of such nonradar tower facilities.

During IFR weather approaches, airmen should be aware that at airports with towers that are not radar-equipped, IFR departures may be released until the inbound pilot reports over the outer marker to the tower. Any failure or delay in making the frequency change or marker passage during the approach may set up a takeoff-landing conflict on the active runway.

Although the procedural ATC limitation of automatic termination of radar service during visual approaches is clearly emphasized in FAA publications, the elimination of the service without advising the pilot appears to disregard the human factor element.

Without a routine and constant oral reminder to the pilot that radar services are being terminated, ATC system reliance upon a written procedure seems unrealistic. Such trust in human behavior is further weakened by the knowledge that AIM publications, certain portions of which may be highlighted in some flight operations manuals, are not required "book" knowledge by the typical air carrier flight standards departments. The issuance of Federal Air Regulations as entire chapters in Flight Operations Manuals does not provide for immediate retrievability or ready assimilation in a busy cockpit.

In the same manner that the controller's transmission "in radar contact" eases cockpit atmosphere, so the phrase "radar services terminated" might well trigger increased pilot vigilance during visual approach operations. Omission of the termination phrase probably reduces frequency congestion within terminal airspace; however, as a procedural compromise, it may contribute to unwarranted airman expectations of radar intervention at a time when no intervention should be anticipated.

In minor misunderstanding of ATC functions, several air carrier reports complain of approach controller practices in clearing them for visual approaches. "We are always asked to report the field in sight and when we do we are then given a visual approach to the airport." AIM states as a duty of the controller: "Issues visual approach clearance when the pilot reports sighting the airport"

The risk of midair conflicts during a visual approach may vary considerably according to the physical location of the airport and the ATC terminal airspace configuration in which the airport is situated. The proximity of busy general aviation fields associated with non-TCA controls at air carrier terminals can increase significantly the hazard of legal VFR aircraft crossing through or near the approach lanes.

Approach Control cleared us for a visual approach to runway 34R. I contacted the tower just prior to turning base leg and we were cleared to land. My F/O was flying and as we made our turn I spotted a small aircraft heading toward us at the same altitude. It happened so fast that no evasive action was taken. I don't think the other pilot saw us; he passed behind us by about 200 to 300 ft. Apparently neither the tower nor Approach Control was aware of the other aircraft's presence.

Conflict avoidance limitations of the ATC system associated with airspace configuration and airport runway layouts— With regard to potential midair conflicts, each category of ATC terminal control has its own peculiar limitations, whether TCA, TRSA, or non-Stage III airspace. Airport runway layouts, especially parallel and intersecting patterns, also contribute to many air carrier traffic incidents.

Airmen must have a realistic appreciation of these airspace-airport problem areas in order to correlate their see-and-avoid vigilance with ATC limitations in providing radar surveillance service. Probably the highest pilot expectation of all-encompassing radar security occurs within TCA airspace. This human factor probably explains, in some measure, the chagrin and indignation often expressed in ASRS reports involving conflicts associated with TCA controls.

TCA boundary lines are meaningful: they have been planned to provide maximum security for air carriers and other suitably equipped aircraft *within* the controlled airspace and for flexible,

self-channeling of VFR aircraft *outside* the airspace. TCA boundary lines outline very specific ATC limitations: aircraft entering and exiting TCA airspace are not only passing through transient aircraft altitudes heavily congested with traffic but are encountering nontransponder equipped, non-communicating VFR light aircraft which are often unseen or unnoticed by the radar controller.

We were approaching the XYZ VOR, heading 110° and level at 11,000. We were cleared after overhead to turn to 130° and descend to 6,000. Over the VOR, turning right and leaving 11,000, I was busy resetting my heading cursor when S/O yelled "Look out!" I looked up to see a light aircraft go by our left wing tip, about 100-150 ft away. No time to do anything. Approach Control did not have the aircraft on radar. Why, I do not know.

"Do not expect all traffic to be pointed out," is stated in AIM. TCA boundary areas, especially the over-TCA-ceiling altitudes, are operational limits which should be well known to air carrier pilots.

As an "additional service," VFR traffic point-outs to air carrier crews may or may not be issued.

You have complete discretion for determining if you are able to provide or continue to provide a service in a particular case. Your reason not to provide or continue to provide a service in a particular case is not subject to question by the pilot and need not be made known to him.

Controller Handbook (7110.65B) p. 85.

Occasionally, unauthorized aircraft penetrate the TCA radar "fences." Although these incidents can be attributed usually to inexperience or unfamiliarity, there are a number of ASRS reports that indicate that some VFR pilots choose "not to play the ATC game": too many communications, too much delay, often vectors not on the direct line of flight from "A" to "B," even the possibility of holding, which is anathema to some VFR airmen.

The presence of these ATC system nonparticipants helps to explain controller reports that relate to near midair conflicts, followed immediately by the sudden appearance of a VFR transponder squawk on the radarscope. Many of these "unknown VFR traffic" aircraft are identified as twin-engine models in the air carrier crew sightings.

In non-TCA terminal airspace, no boundary limits apply except the 5-mile radius, 3,000 ft cylinder of the airport traffic area. It is during approaches to these airports that pilots can anticipate "legal" encounters anywhere in the vectoring area, including the ILS localizer courses.

In airport layout design, the use of parallel runways — in the interest of faster traffic handling — provides a physical situation that is ready to link with any pilot or controller error to cause an incident. When parallel runways are immediately adjacent, any ground-cockpit communication misunderstanding of clearances regarding use of left-right runways becomes highly significant.

At the larger terminals, use of parallel runways for simultaneous departures can create conflict opportunities. A faster aircraft may overtake a slower one, a leading aircraft may abruptly turn on course into the path of a following departure, an aircraft may slow-drift in heading into the

adjoining lane. Frequently, a pilot's delay in initiating takeoff roll throws off the controller's timing.

If both aircraft have been cleared over to Departure Control, the wait is long; it seems longer still if the radar targets are merging and neither pilot has come up on frequency.

The two aircraft were 3 miles offshore before the first one came up on Departure Control. By that time the targets had merged. We had no way to communicate with them.

* * *

Visual separation had been applied but both aircraft climbed into the overcast and tower visual sighting was lost. Both aircraft were late coming up on Departure frequency; they were on converging courses before communications were established.

Conflict avoidance limitations of the ATC System: "System Errors"— Air carrier airmen are usually aware, often acutely aware, of their own behavioral mistakes or omissions in the cockpit. It is reassuring to read straightforward admissions of personal "goofs" in ASRS reports: professionalism requires such self-honesty for growth. Furthermore, such reports provide to ASRS the study material for the human factor research that is so urgently needed in the aviation field.

However, in conflict avoidance situations, ATC functioning is vulnerable to failure from two sets of human factor limitations: the pilot user and the controller operator of the system. Although the majority of controller reports to the ASRS are as frank and open as the airmen reports of omissions or self-fault, the somewhat euphemistic terms of "system deviation" and "system error" are invariably used in narrating the causal factors of a conflict incident. System error is as frequent and as potent a factor as cockpit blunder in the primary or contributing causes of midair near-collisions.

In blunter language, a system error during a conflict situation, as reported to the ASRS, usually is associated with one of four general categories of ATC problems: (1) a controller "forgot" about an aircraft, (2) a controller failed to monitor progress of a flight adequately, (3) interfacility or intrafacility miscoordination, or (4) malfunction or breakdown of ATC radar equipment.

The potential in such human or electronic failures is the elimination or critical lapsing of a radar controller's surveillance of two targets on collision or near-collision projected flightpaths.

After the hand-off to approach control we observed the targets merge with both aircraft having checked in at 4,000 ft.

* * *

The radar computer failed and the two aircraft targets disappeared leaving no means to separate them. Broadband radar was initiated just as the two radar targets merged.

* * *

At approximately 2025Z my attention was drawn to the radarscope. I saw two targets together, one indicating level FL290, the other data block reading 290N240. I did not know until later that the second aircraft was in fact at FL290.

* * *

As I sat down at the table, I saw two targets merging on the radar

Furthermore, the absence of surveillance protection may be unknown to the airmen involved in the impending conflict. Supposedly secure in a radar environment, they are actually operating solely under the see-and-avoid concept.

Although radar controller misperceptions usually have direct cause and effect relationships with traffic conflicts, intrafacility and interfacility miscoordinations often reflect errors or omissions committed in adjoining sectors, at different control facilities and in previous time periods. ATC controllers "own" their individual airspace. As an air carrier passes through the ATC structure, its progress must be coordinated through a multitude of controller actions, frequency changes, control transfers, pointouts, and radar handoffs. During an intrafacility or interfacility coordination failure, it is often not only the pilots but also the receiving controller who is usually "left in the dark" concerning significant traffic. As a result, he is unaware that intervention may be urgently required.

One such sector-to-sector misunderstanding was reported concerning a handoff of an aircraft which was not equipped with a transponder and which was operating over a very congested airway. The controller had been advised that 5,000 ft was the assigned altitude, whereas the pilot actually had been given 6,000 ft and was flying at 6,000 ft. Without apprehension or concern, the radar controller observed numerous opposite direction targets at 6,000 ft passing close by the aircraft. The pilot then called, requesting a different altitude because "so many aircraft seem to be coming right at me, all at my altitude."

I asked his altitude and when he said "6,000" I was stunned. I told him to turn 90° immediately and descend to 5,000 ft. There was head-on traffic at 6,000 ft only 3 miles away.

ASRS files include typical system deviation or system error categories as the following:

1. Incomplete traffic briefing of relief controller: "I don't know. I just sat down at the table"
2. Controller training activity: "The trainee seemed to have settled down somewhat; when he cleared the aircraft for immediate takeoff it caught me by surprise. By the time I rechecked the position of the other aircraft, it was too late" "Before I could cut in"
3. Over-stress: "I was working combined positions for the high and low sectors and traffic was heavy."
4. Workload distraction: "I had an aircraft on an emergency. When I looked again, the targets were merging"

5. External interruptions: "Two or more people were walking constantly back and forth and they partially blocked my view"

6. System malfunction: "The computer failed and it took us a long time to set up manual operation. In the meantime, four aircraft were not controlled"

7. System saturation: "Thunderstorm activity . . . I had aircraft diverting all over the place"

8. Coordination breakdowns: "My hand-off man forgot to" "I forgot to advise" "The ground controller cleared an aircraft across the active but"

There are many categories of facility control system errors, but it is not the purpose of this study to enumerate ATC failures. Human behavior factors are noted only as significant ATC system limitations that may result in failure of the radar surveillance concept at any time, at any altitude, or in any airspace.

"Big Brother" is often looking elsewhere.

When the air carrier was about 17 miles northwest the conflict alert began blinking. A quick check showed an inbound aircraft converging with the airliner. I called the approach controller; he was not working the inbound (he should have been). I then called the center controller. For some reason the center had lost track of the inbound.

* * *

The two aircraft, one climbing, one descending, were on collision course. It was impossible to attain radio communication with either aircraft in time to separate them.

* * *

The two aircraft were 15 miles apart, head-on, when I noticed the conflict. I told Approach Control to stop one aircraft at 9,000. Approach Control said he was between frequencies and had been given the wrong sector frequency. The second aircraft was at 10,000. I told him to turn immediately and climb to 12,000. The first aircraft had gone back to Approach Control for another frequency. This time they gave him the correct frequency and he came up, reporting out of 9,600 ft. At that time, the first aircraft was out of 10,300. Thirty seconds later, they were clear.

Conflict avoidance limitations of the ATC system: radar equipment limitations— Although the capabilities of primary radar to depict weather are not diminished during full automation mode operation (radar data processing — RDP), nevertheless the controller's actual display of precipitation is far different from that expected by the typical airman. To the pilots on a "red eye" midnight special, dodging around cumulonimbus thunderheads, it often must appear that the ground radar-scope is a giant screen that paints far more efficient contours than their own diminutive tube.

"Why did I have to argue with the controller about deviation?" asks one pilot. "He should have seen our need."

During RDP operations (usually 20 hours a day), the controller does not see actual targets; instead, he views a computer-generated electronically reproduced picture in the form of digitized information. Weather precipitation returns are filtered through two preset levels of intensity. The lower threshold setting eliminates presentation of any light precipitation; the upper threshold depicts contour lines with heavy echo densities. The radar operator can lighten the intensity or completely eliminate the contour-line weather presentation in order to improve his tracking of aircraft targets through the precipitation returns.

During broadband operation (during nonautomated mode), circular polarization cancels out returns from spherical objects, such as raindrops. Vertical motion, however, permits recapture of elongated patterns. "Circular polarization," states the AIM, "will eliminate some weather returns."

Individual aircraft deviation around clouds seldom causes a conflict situation, but a widespread belt of turbulent cold-front diversions, if permitted or performed without authorization, can overload the capabilities of ATC's separation controls.

At times, without malfunctioning, radar targets may disappear from controller scopes. For example, aircraft in the "main bang" (overhead transmitter sites) are temporarily lost from the radar display. If radar separation is being provided, aircraft are normally vectored around the antennae area. The moving target indicator (MTI) has a designed idiosyncrasy in erasing targets synchronized at its speed. "Blind Speed" is the apt ATC descriptor for this radar limitation.

These system deficiencies are minor elements in avoidance surveillance, however, when set into context with the large number of ASRS reports that involve inability or failure to depict light aircraft targets prior to a conflict. As AIM points out: The amount of reflective "skin" surface of an aircraft will determine the size of the radar return. Ground clutter and temperature inversions may obscure weak primary targets; relatively slow motion increases the time requirements for initial target recognition. Under the best conditions, a small, light airplane will be more difficult to see than a large commercial jet.

Controller difficulty in sighting the primary blip of a small aircraft, without a transponder, against a background of alphanumeric block readouts of air carrier jet returns probably constitutes the most important and most misunderstood limitation of the ATC system. It is a circumstance that not only negates the radar surveillance-controller intervention concept but one that also can link simultaneously with airman human factors in concealing the immediate urgency of see-and-avoid evasiveness.

Summary and Conclusions

In the anticipation that airplanes will not always function as designed, air carrier airmen spend considerable training time in the study of in-flight recognition and handling of aircraft system malfunctions and failures. Despite the fact that controllers also train to handle malfunctions and abnormalities in the ATC system, the majority of controller reports to the ASRS are, in a broad sense, "logbook" entries of malfunctions and failures of the system. The primary causes of the problems

are usually human behavior factors, but the errors invariably result in temporary deficiencies or lapses in what might be called “normal” ATC operation in U.S. airspace.

The impetus for this study derived from the surprise reported by so many professional airmen in their individual encounters with “abnormal” ATC operation during conflict-avoidance situations. Routine expectation of radar surveillance often apparently produced an exaggerated dependency on controller intervention; there was minimum consideration of possible service interruptions or of breakdowns within the monitoring service. The adequacy of the see-and-avoid responsibility in overcoming the deficiencies of the radar surveillance concept may be questionable and debatable (“more a hope than a method,” states one airman) but the present ongoing realities of the operating limitations of the ATC system should be recognized and anticipated.

Drawing from the narrative contents of many hundreds of ASRS reports, this study attempts to highlight certain areas of air carrier operations during which ATC radar services may fail, may be withdrawn, or may be misled into passive target observation. During traffic-converging situations, when controller intervention is anticipated but is not implemented, the pilots of the converging aircraft are thrust unknowingly and unexpectedly into the final evasive phase of the see-and-avoid response.

Probably more important as a midair conflict causal link than any other limitation is the apparent inability (or difficulty) of the radar controller to sight and point out numerous light aircraft that are not equipped with transponders, and to do so soon enough to permit early avoidance of potentially conflicting aircraft. This deficiency is most frequently cited during TCA boundary area conflicts and during initial approach maneuvering into non-TCA airports.

Two-way communication — immediate, direct, and unequivocal — is the air-ground-air link that activates and coordinates airman and controller responses in the avoidance of traffic conflicts. When communication messages are absent, misunderstood or incorrect, the protective concepts of the ATC system are seriously weakened or rendered inoperative.

Faulty intracockpit management in the validation of ATC clearances or instructions often is a primary factor. Controller failures to monitor readbacks may permit a potential conflict to develop into an actual physical incident. During the conduct of visual approaches, ambiguous or misleading cockpit messages may blur controller understanding that pertinent traffic has been sighted or definitely identified.

Perhaps symbolically as well as realistically, the following airman narrative sums up all the essential conflict-avoidance elements in the adequacies and limitations of the ATC system.

Climbing out of XYZ airport we were given traffic, twelve o'clock. We asked for vectors around the traffic. The controller said, “Unable.” We asked, “Why not?” The controller said: “It’s too late.”

ALERT BULLETINS

Introduction

During the report analysis process, ASRS staff members frequently recognize situations that require prompt attention in the interest of increased aviation safety. Through the Alert Bulletin medium, it is often possible to call these problems to the attention of those in the best position to effect a change if a problem does exist. As in earlier Quarterly Reports, a sample of Alert Bulletins is presented here, with the responses they have called up. The examples that follow are grouped by general category to aid readers with particular interests.

Air Navigation

1. Text of AB: Connellsville, PA, Connellsville Airport: Reporting aircraft flight crewmember describes apparent faulty operation of the Connellsville nondirectional beacon; during a recent flight usable ADF signals were not received until the aircraft was 12 miles from the airport, at which time a strong signal was received but provided highly erroneous bearing information. Reporter states that evidence of corrosion exists at the beacon antenna site, that maintenance is performed infrequently, and that the situation described is frequently encountered during periods of precipitation. He also reports that other pilots have reported this condition, which can be hazardous to flight in view of the mountainous terrain in the Connellsville area.

Text of FAA Response: The subject facility was thoroughly evaluated by an AEA-400 FAA Inspector and flight-tested by an FAA flight inspection aircraft June 19 and May 2, respectively. The results of the evaluation revealed no facility deficiencies to support the allegation contained in the Alert Bulletin.

* * *

2. Text of AB: Mt. Vernon, OH, Knox County Regional Airport: Pilot reporter points out an apparent cartographic error on the Detroit Sectional Aeronautical Chart, on which Knox County Airport appears to be incorrectly located. The Appleton VORTAC radial to the airport as shown on instrument approach charts is correct, but does not agree with that plotted on the sectional chart, on which incorrect coordinates have been used for the airport location.

Text of FAA Response: The location of facilities and features on VFR Aeronautical Charts are not necessarily the exact position, and no attempt should be made to obtain precise bearings and distances from them.

There are several reasons why facilities might be slightly off location. The first is unintentional and is due to the difficulty of registering the different colors to each other during the printing process. This is considered no problem even when registration is off by as much as a half mile as long as the features are in the proper relationship to each other. The second reason is intentional and is done for clarity. Due to the size of the symbols, adjacent features, if precisely located, could overlap each other making it difficult or impossible to read. To improve readability in congested areas, features are displaced but proper relationship maintained.

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The displacement of Knox County Airport is due to registration; however, consideration will be given to shift the symbol slightly west to bring it closer to the radial, as shown on the IAP Chart.

Airports: Facilities and Maintenance

3. Text of AB: San Francisco, CA, San Francisco International Airport: Citing numerous pilot reports and ATIS broadcast sequences calling attention to poor aircraft braking response on runway 19L during wet weather, a pilot reporter asserts that the southerly portion of 19L between its intersection with runway 28R and the runway 1R threshold is extremely slippery when wet. He contends that a rejected takeoff with the runway wet, with no overrun available, could have serious consequences, and recommends that immediate steps be taken to correct the situation cited. Reporter proposes that, in the event that alleviation is not possible, runway 19L be closed to traffic in wet weather even though this action might result in temporary cessation of airport operations.

Text of FAA Response: Our coordination with San Francisco Airport's Engineering Division confirms the following:

1. The bid opening for the grooving on runway 1R-19L is being held today, April 6, 1979.
2. Award of the grooving contract will be made by April 24.
3. The grooving work is to commence by the middle of May coincident with the intersection overlay work of runways 1R-19L and 10L-28R.
4. The grooving of the critical portion of runway 1R should be completed by the middle of June 1979.

* * *

4. Text of AB: Indianapolis, IN, Indianapolis International Airport: A reporting controller states that the latest (January 25, 1979) issue of United States Government (NOAA) Instrument Approach Procedures, as well as commercial charts which utilize NOAA data, are substantially inaccurate in their depiction of taxiways at Indianapolis International Airport and that this condition is confusing to controllers and pilots. Reporter contends that taxiways that no longer exist continue to be shown, that newer taxiways do not appear, and that charted designations are incorrect. He alleges that this condition has been reported to NOAA by airport management and ATC, but those reports have not been acknowledged. The reporter contends that the lack of accurate chart information is potentially hazardous.

Text of FAA Response: We were informed today by the Acting Chief, Instrument Approach Procedure (IAP) Chart Branch, NOS, that the corrected information will be reflected in the IAP dated May 17, 1979. He also stated that the information was sent by AAT-435 on March 20, which was too late for the March 22 cutoff date for an earlier revision and publication.

* * *

5. Text of AB: Knoxville, TN, McGhee-Tyson Airport: A controller reports that radio transmissions from McGhee-Tyson tower on tower and approach control frequencies are seriously degraded to the extent that many messages must be repeated and are often misunderstood or missed altogether. Reporter considers the condition hazardous to flight operations and contends that it increases controller workload and causes distraction. He notes that extensive construction since the original locating of the antenna sites, low antennae height, and reduced power output all contribute to reception blind spots in certain areas and to the poor reception generally of radio transmissions; he recommends that a new transmission site, utilizing equipment presently available at the facility, be constructed.

Text of FAA Response: The Southern Regional Office, Airway Facilities Division, is not aware of communications problems at Knoxville, Tennessee, McGhee-Tyson Airport. However, the extensive construction noted in the Alert Bulletin has forced the FAA to seek a new communications site. They estimate that a new site will be in operation by approximately January 1980.

* * *

6. Text of AB: St. Louis, MO, Lambert Field Airport: Over a period of time, reports have indicated poor aircraft braking and steering response after landing on runway 12R at Lambert Field during wet weather. Hydroplaning is suspected, and a reporter suggests that runway grooving might alleviate the problem.

Text of FAA Response: Runway 12R is scheduled to be grooved this summer. With regard to St. Louis Airport, the enclosed memo from the ALPA Regional Safety Chairman is forwarded for your information.

Airports: Lighting and Approach Aids

7. Text of AB: A pilot reports that at Beverly, MA Airport (BVY) the inbound course of the SDF approach for runway 16 has a bend which results in runway offset at a critical point in the approach. Corrective action is requested; bend is serious enough to have caused missed approaches.

Text of FAA Response: The Beverly, MA Airport (BVY) SDF was inspected on August 14, 1978, because of the user complaint cited in ASRS AB-78-38. The bend mentioned was found by the flight inspection crew on aircraft N-84; however, it was within the tolerances specified in the United States Standard Flight Inspection Manual.

It may be significant to note that the BVY SDF is offset which, if the pilot was not aware of the offset, might tend to make the bend seem exaggerated.

* * *

8. Text of AB: Huntsville, AL, Madison County Jetport: Pilot taxiing east on taxiway J at night followed blue lights which turned south and led him to an unimproved dirt surface instead of to taxiway G farther east. He recommends that misleading lights be extinguished.

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Text of FAA Response: September 18, 1978. Airport manager reports by telephone that the two blue taxiway lights on the short taxiway to an unpaved area have been extinguished; the two red taxiway lights just beyond these extinguished lights will remain in operation.

* * *

9. Text of AB: Hyannis, MA, Barnstable Municipal Airport: A recent report states that the VASI lights for runway 6 at this airport have been out of service since February 1978. The reporter indicates that the VASI glide-slope guidance on this runway is needed because of buildings and other obstructions in proximity to the final approach path; the report suggests that the VASI should be restored to operation as soon as possible.

Text of FAA Response: The facility cited in the subject report is a non-FAA facility and maintained by the Airport Authority. While the facility was not out of service for the length of time cited in the report, it was out of service intermittently through the period and continues to be unreliable to the present time. Local FAA personnel are consulting with the Airport Authority in an attempt to improve its reliability.

* * *

10. Text of AB: Norfolk, VA, Norfolk International Airport: A controller reports that a recent failure of commercial electric power deprived Norfolk TRACON of all radar and radio communication capability and caused loss of airport runway lighting. The failure was compounded when a backup commercial power source remained unavailable because of a faulty switching mechanism. Battery-powered transceivers were available in the tower, but not in the radar room. Reporter contends that, lacking radar and radar-room communication capability, with no runway lighting, and with only limited tower radio communication possible, a hazardous separation problem was avoided only because existing air traffic volume was untypically light. Reporter suggests that undue reliance is being placed upon a demonstrably unreliable source of emergency power.

Text of FAA Response: The problem with loss of commercial electric power at the Norfolk TRACON appears to have been the cause in two different sources:

1. A loss of power at the tower and TRACON itself would cause a loss in the communications and radar data capability. As indicated, there is a backup battery source for communications but not for the radar service. At Norfolk a backup engine generator at the tower is scheduled for installation in June, 1979. With installation of this generator the TRACON will be provided backup power for the radar and radio communications.

2. The second power failure source in the report relates to the runway lighting, which is a responsibility of the airport sponsor. Normally, these systems are without backup standby power and would require traffic to proceed to its alternate if runway lighting is lost during the time it is required.

Air Traffic Control: Facilities and Procedures

11. Text of AB: Aurora, IL, Chicago Air Route Traffic Control Center: Controller reports have been received which indicate that a serious problem may exist with the ZAU radar site at Hanna City, IL. The reports allege that when aircraft pass over the antenna site, the computer drops the track, and the data block becomes erratic, in some cases reversing course. The reporters contend that as a consequence of this condition, controllers are frequently faced with a critical problem of maintaining radar identification while reverting to broadband radar for traffic separation.

Text of FAA Response: The problem stated in the subject document resulted from aircraft flying above 20,000 ft within 8 miles of the site responding to over-the-antenna interrogations. An improved beacon omniantenna and a modified STC curve have been installed which correct the problem.

* * *

12. Text of AB: Miami, FL, Opa Locka Airport: A recent report states that a radio blind spot exists on the primary tower frequency at the end of the approach to runway 27R at this airport. To resolve the communications problem between the tower and aircraft positioned or holding on the ground at runway 27R, a Gonset radio is used. Allegedly, numerous occasions occur where a landing aircraft and one cleared for takeoff require rapid adjustments to preclude a potential conflict, attesting to the unreliable and unsatisfactory communications. A previous report cited the inability of the tower to override pilot transmissions and also noted the lack of a guard channel.

Text of FAA Response: The subject bulletin describes a situation at the Opa Locka Airport whereby there was a radio blind spot for the tower frequency on runway 27. An investigation of the problem resulted in the changeout of some relays and an antenna. To date there have been no more complaints of the problem at Opa Locka Airport. The reported situation is considered corrected.

* * *

13. Text of AB: Providence, RI, Providence Green State Airport: A pilot report notes that the ATIS recorded transmissions from this facility are frequently difficult to understand because of enunciation and diction problems. Reporter considers that safety of flight may be compromised through misunderstanding and by the attention-diverting necessity to monitor the broadcast information repeatedly in order to receive usable data. He recommends that personnel recording ATIS messages be reminded of the vital importance of clarity and intelligibility in their radio transmissions.

Text of FAA Response: Providence tower has issued a notice that outlines corrective action to be taken by supervisors to improve the Airport Terminal Information Service (ATIS) operation. This includes a review of Order 7210.3D, paragraph 1351.b, a playback requirement, and a tape monitoring problem.

Additional followup action requesting periodic pilot reports of ATIS readability should preclude any future problems.

* * *

14. Text of AB: Longview, TX, Gregg County Airport: It has been reported that the ASR Approach Procedure (for runways 13/31 and 4/22) at Gregg County Airport specifies the runway threshold as the missed approach point and that controllers are to continue providing heading guidance for inbound aircraft to this point. A reporting controller considers this procedure hazardous, as accuracy limitations inherent in ASR equipment permit misalignments of aircraft with the runway centerline by as much as 500 ft to one side or the other. Reporter also states that pilots continuing a radar-guided approach until past the airport boundary are denied adequate time to effect the necessary transition from instruments to visual flight. The report notes that since pilots are restricted from descent below minimum descent altitude before establishing visual contact with the runway, there appears to be no advantage in continuing radar guidance beyond this point. Reporter suggests that MAP should be redesignated as a point 1 mile from the end of the runway.

Text of FAA Response: The suggestion to redesignate the surveillance radar approach missed approach point (MAP) to 1 mile from the end of the runway at Gregg County Airport, Longview, Texas, is not accepted. The suggestion is also not acceptable for national application. The rationale that the MAP at the runway threshold is dangerous because of azimuth inaccuracies in surveillance radar does not consider the protection provided by pilot application of FAR 91.117(b) (1) and (2). Location of the MAP at the runway threshold provides many users a significant operational advantage in that they can safely make normal approaches to the runways of intended landing from the minimum descent altitude at the threshold. This is particularly true in the case of the 10,000-ft runway 13-31 at Gregg County Airport.

Historically this practice has proven safe and effective for the aviation community. No benefits will be gained from changing it.

Hazards to Flight

15. Text of AB: Caledonia, OH, Gist Elevator Landing Strip: An ASRS report notes that Gist Elevator Landing Strip is a designated parachute jumping area, underlying airway V493. Reporter feels that, although the area is listed in appropriate publications and properly symbolized on the Detroit Sectional Aeronautical Chart, safety would be enhanced if the parachute symbol were also to appear on the low-altitude en route charts used in lieu of sectionals by many VFR pilots.

Text of FAA Response: Parachute jumping areas are charted on Sectional Charts in accordance with a criterion based on usage. All jumping areas, regardless of usage, are or will be published in the appropriate Airport/Facility Directory, indicating whether the area is charted or not. Granted, some users use the Enroute Charts for VFR flying, but they should use these charts in addition to, not in lieu of, the Sectionals.

There are many VFR features on Sectional Charts that are not on the Enroute Charts. To single out and indiscriminately add selected parachute jumping areas to Enroute Charts would not enhance safety, but could be a disservice, giving and encouraging the VFR pilot to conclude that the Enroute Charts are also designed for VFR flight.

With the endorsement of the Defense Mapping Agency and the Aircraft Owners and Pilots Association, we strongly advise against adding parachute jumping areas to the Enroute Charts.

16. Text of AB: Hayward, CA, Hayward Air Terminal Airport: A pilot reports that military helicopters utilize a taxiway adjacent to runway 28L at this airport to practice hovering maneuvers. The reporter contends that whenever there is a left crosswind the rotor wash drifts across the runway, creating a serious control problem for landing aircraft. One report alleges that ATCT controllers do not move the helicopter to another location until after they have received a complaint from a pilot. The reporter suggests that waiting for a pilot complaint may be too late if the first exposure to the condition results in an accident or incident.

Text of FAA Response: The helicopter hover test area at Hayward Airport will be relocated in the very near future to resolve the potential problem of rotor wash across an active runway.

* * *

17. Text of AB: Various locations: Three recent pilot reports suggest that the increasing popularity of powered hand-glider flying may indicate an emerging hazard to air traffic. An air carrier pilot reports a near miss while descending through 3,500 ft on downwind for landing at Raleigh/Durham (RDU). He flew between hang gliders estimated to be 1,000 ft apart, without time for evasive action. In a second reported instance, the pilot took action to avert a potential collision with a hang glider at 1,800 ft, beneath the floor of St. Louis (STL) TCA. The third report mentions powered hang-glider flights within the Honolulu (HNL) Airport traffic area. The three reporters recommend some form of flight and airspace training for pilots of powered hang gliders and that the pilots be required to hold some type of FAA Airman Certificate. Lack of radio communication capability and of radar reflectivity of the gliders are also mentioned as contributing to the potential hazards inherent in the present unregulated conduct of powered hang-glider flights.

Text of FAA Response: The Federal Aviation Administration (FAA) has been monitoring the continued growth of hang-gliding activity for several years. Because of the low cost and relative simplicity of operation, hang gliding became an active sport in the early part of the 1970s. In recognition of this growth, the FAA developed and published an advisory circular suggesting safety parameters and precautions for hang gliders.

As we approach the 1980s, it has become evident that certain regulatory actions are necessary with regard to hang-glider operations in the national airspace system.

A regulatory project has been authorized by the Air Traffic Service to issue a notice of proposed rulemaking for public comment before the end of this year. The proposal will amend Federal Aviation Regulation Part 101 to include hang-glider operations. If adopted, this amendment will define the operational areas in which hang gliders may participate. This will be a major step forward correcting the difficulties outlined in Alert Bulletin 79:86.

Ames Research Center

National Aeronautics and Space Administration

Moffett Field, California 94035, April 2, 1980

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16. Abstract <p>This tenth report contains another in a series of studies of human factors in air carrier operations – Knowledge of Limitations of the ATC system in Conflict Avoidance Capabilities. The study addresses some of those assumptions and expectations held by airmen regarding the capabilities of the system. Limitations related to communication are described and problems associated with visual approaches, airspace configurations, and airport layouts are discussed.</p> <p>The first section of this quarterly report presents a number of pilot and controller reports illustrative of three typical problem types: occurrences involving pilots who have limited experience; reports describing in-flight calls for assistance; and flights in which pilots have declined to use available radar services. The final section includes examples of Alert Bulletins and the FAA responses to them.</p>					
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